

Forest Products

Sector At-a-Glance

Number of Facilities:	15,000
Value of Shipments:	\$210 Billion
Number of Employees:	850,000

Source: U.S. Census Bureau, 2001¹

Profile The forest products² sector includes companies that grow, harvest, or process wood and wood fiber for use in products. While the industry has operations in all 50 states, it is concentrated in the southeast and Great Lakes regions of the country.³

The forest products sector can be divided into two segments: one manufactures pulp, paper, and paperboard products; and the second produces engineered and traditional wood products. In recent years, decreases in demand from U.S. customers and increased foreign competition have negatively impacted the pulp and paper segment. Losses in the wood products segment have been minimized by the continued boom in the home building and improvement sector. Additional factors, such as improved efficiencies of new equipment and over-capacity in the market, have resulted in the closure of 100 paper mills and 125 wood products facilities and the elimination of more than 127,000 jobs since 1997.⁴

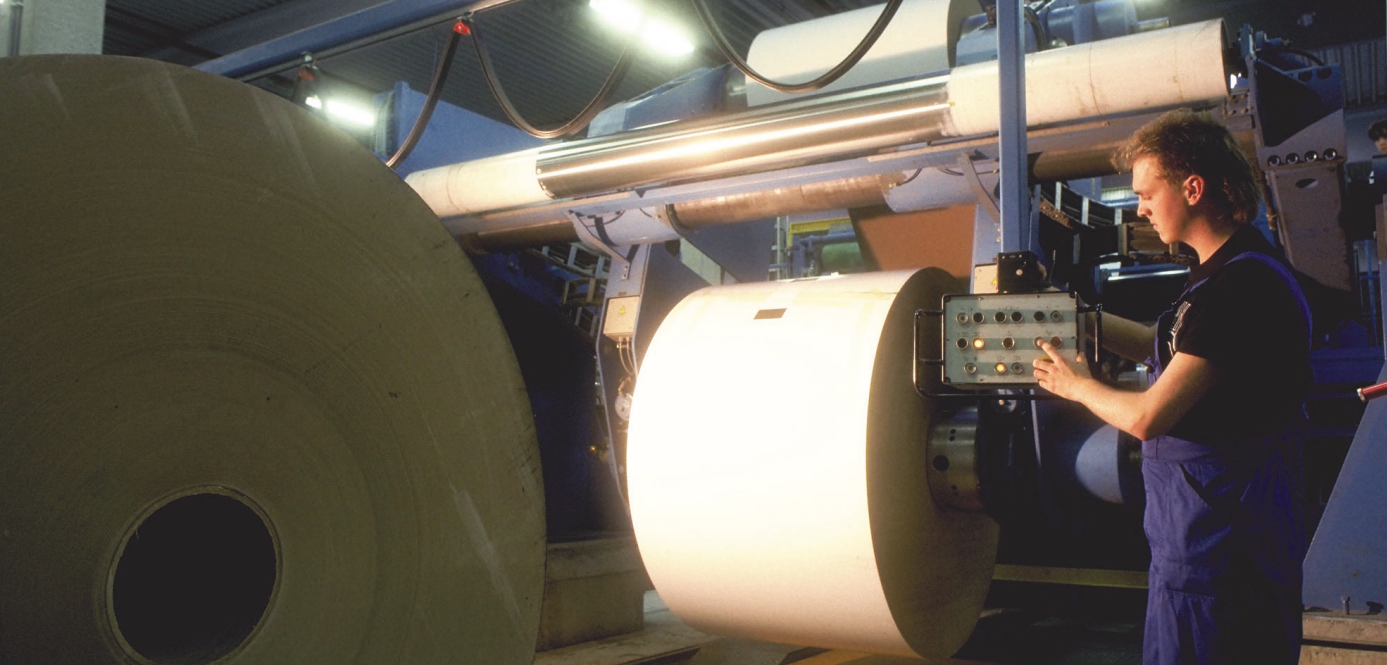
PRODUCTION PROCESS Forest products are manufactured through a variety of processes:

- ■ ■ ■ To produce paper and paperboard products, wood material is digested or cooked down to make pulp, then the fibers are separated from impurities, bleached (if necessary), dewatered, pressed, and rolled.
- ■ ■ ■ To produce lumber, logs are debarked and cut first into “cants”, then cut into specific lengths of sawn lumber, dried, and coated with surface protection.
- ■ ■ ■ To produce veneer or plywood, logs are peeled or sliced into thin strips, dried, layered and glued to form panels, then pressed into boards.
- ■ ■ ■ To produce reconstituted wood products (such as medium density fiberboard), raw wood is shredded or ground, mixed with adhesive, then pressed into boards.

PARTNERSHIP The American Forest & Paper Association (AF&PA) has formed a partnership with EPA’s Sector Strategies Program to improve the environmental performance of the forest products industry. AF&PA’s more than 200 members manufacture more than 88% of the printing and writing paper and 60% of the structural wood products produced in the U.S.⁵

KEY ENVIRONMENTAL OPPORTUNITIES The forest products sector is working with EPA to improve the industry’s performance by:

- ❑ Increasing energy efficiency;
- ❑ Reducing air emissions;
- ❑ Managing and minimizing waste;
- ❑ Conserving water;
- ❑ Improving water quality;
- ❑ Encouraging sustainable forestry; and
- ❑ Promoting environmental management systems.



Increasing Energy Efficiency

Given the energy intensive nature of its manufacturing processes, reducing energy consumption is an important environmental focus for the forest products sector. In 1998, the industry consumed more than 3,200 trillion Btus of energy, making it the third largest industrial consumer of energy among U.S. manufacturing sectors. Within the sector, the pulp and paper segment accounts for 85% of the energy use, while the wood products segment accounts for 15%.⁶

To minimize the environmental impact of its energy consumption, the forest products sector is investing in a variety of generation technologies and alternative fuels, including:

- ■ ■ Cogeneration;
- ■ ■ Biomass fuel; and
- ■ ■ Black liquor gasification.

Cogeneration

The forest products sector has emerged as a leader in the utilization of cogeneration, a highly efficient process that produces electricity and heat from a single fuel source. Within the forest products sector, 88% of the electricity generated at pulp and paper mills and 99% of the electricity generated at wood products facilities is produced through cogeneration.⁷

Biomass Fuel

The forest products industry is unique in its ability to use byproducts generated in the manufacture of pulp, paper, lumber, and other wood products as a biomass fuel source. Biomass fuel includes materials such as “hogged fuel”, which comprises logging and wood processing byproducts, and “spent pulping liquor”, which comprises extracts from the pulping process. In 2000, these renewable energy sources comprised 56% of energy consumed at pulp and paper mills and 63% of energy consumed at wood products facilities.⁸

Black Liquor Gasification

To further reduce its use of fossil fuels, the forest products industry is partnering with the U.S. Department of Energy (DOE) to develop an energy generating process called “black liquor gasification”. Gasification will convert spent pulping liquors and other biomass into combustible gases that can be burned efficiently like natural gas.

Although expensive to develop, biomass gasification technologies have the potential to satisfy the energy needs of the forest products industry and to generate a surplus of almost 22 gigawatts of power per year that could be sent to the electric power grid. In addition, black liquor gasification will reduce emissions of air pollutants, such as nitrogen oxides, sulfur dioxide, and particulate matter. The first state-of-the-art biomass gasifier is now being built by Georgia-Pacific in Big Island, VA.⁹

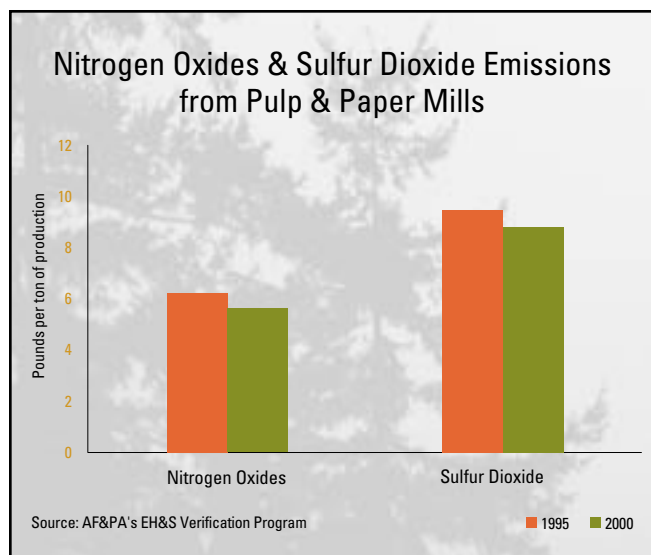
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Reducing Air Emissions

The forest products sector is working to reduce emissions of nitrogen oxides (NO_x), sulfur dioxide (SO₂), and greenhouse gases (GHG).

Nitrogen Oxide and Sulfur Dioxide Emissions

Between 1995 and 2000, emissions of NO_x per ton of production in the forest products sector decreased by 10%, and emissions of SO₂ per ton of production decreased by 7%.¹⁰ The following factors contributed to SO₂ reductions: increased use of lower sulfur content coal, increased use of flue gas desulfurization systems, and the retirement of chemical recovery furnaces with direct contact evaporators.



Greenhouse Gas Emissions

In 2003, AF&PA joined Climate VISION, a voluntary program administered by DOE to reduce U.S. greenhouse gas intensity (the ratio of emissions to economic output).¹¹

In order to reduce GHG emissions, AF&PA members are undertaking a series of programs, including carbon sequestration in forests and products, and the development of technologies to increase use of renewable biomass fuels. Based on preliminary calculations, AF&PA expects that these programs will reduce the sector's greenhouse gas intensity by 12% by 2012 relative to 2000 levels.¹²

Other voluntary efforts are also underway to reduce GHG emissions by forest products companies.

Case Study: Chicago Climate Exchange[®]

Launched in December 2003, the Chicago Climate Exchange[®] (CCX) is the world's first multi-national and multi-sector marketplace for reducing and trading greenhouse gas emissions. It represents the first voluntary commitment by a cross-section of North American corporations, municipalities, and other institutions to establish a rules-based market for reducing GHG emissions.

Four companies in the forest products sector have voluntarily joined CCX[®] and committed to reducing their GHG emissions by 4% below the average of their 1998-2001 baseline by 2006. These companies are: International Paper, MeadWestvaco Corp., Stora Enso North America, and Temple-Inland, Inc.¹³

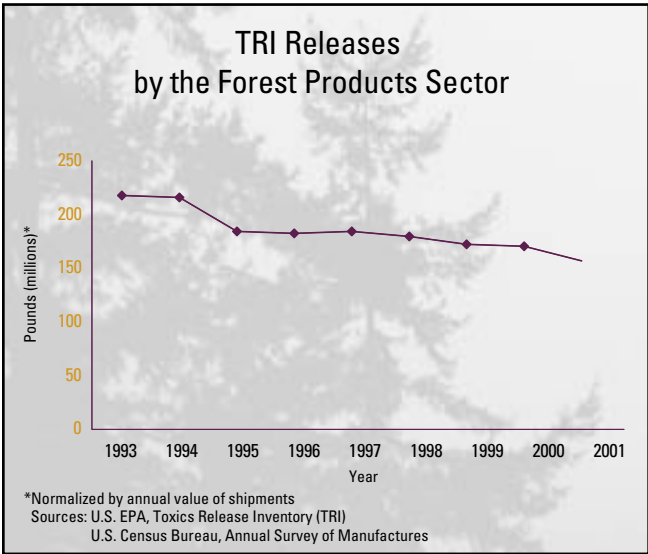


Managing and Minimizing Waste

The forest products sector is reducing waste by reusing non-hazardous industrial wastes from the production process and by promoting recycling of paper products so that mills can use greater percentages of recycled fibers.

Reduction in Environmental Releases

Forest products facilities use a variety of chemicals and report on the release and management of many of those materials through EPA's Toxics Release Inventory (TRI). Over the past decade, the sector has made progress in reducing wastes. Between 1993 and 2001, normalized TRI releases by forest products facilities decreased by 28%.¹⁴



Beneficial Reuse of Waste

The majority of the forest products sector's wastes consist of non-hazardous wastewaters and sludges from pulp and paper mills. These wastes include wastewater treatment sludges, lime mud and slaker grits, boiler and furnace ash, scrubber sludges, and wood processing residuals. In 2000, more than 40% of this waste was reused rather than being burned, lagooned, or sent to a landfill. Waste from wood products mills includes waste wood particles and adhesive residues, the majority of which (90%) is beneficially reused.¹⁵

Recycled Paper Products

AF&PA members are making efforts to increase the recycling of paper products. Their goal is to recover 55% of the paper consumed annually in the U.S. by 2012. AF&PA estimates that 48% of all paper was recovered for recycling in 2002. For some grades, such as corrugated boxes and newspapers, the recovery rate is over 70%.¹⁶

One hundred percent of recovered paper is utilized, and recovered fiber now accounts for more than one-third of the industry's domestic raw material supply.¹⁷

Forest Products

Conserving Water

The forest products sector is the third largest industrial consumer of water among U.S. manufacturing industries. The pulp and paper segment of the industry accounts for most of this water use. Between 1995 and 2000, the volume of water discharged per ton of production, an indicator of water used, decreased by 1.6% in the pulp and paper industry.¹⁸

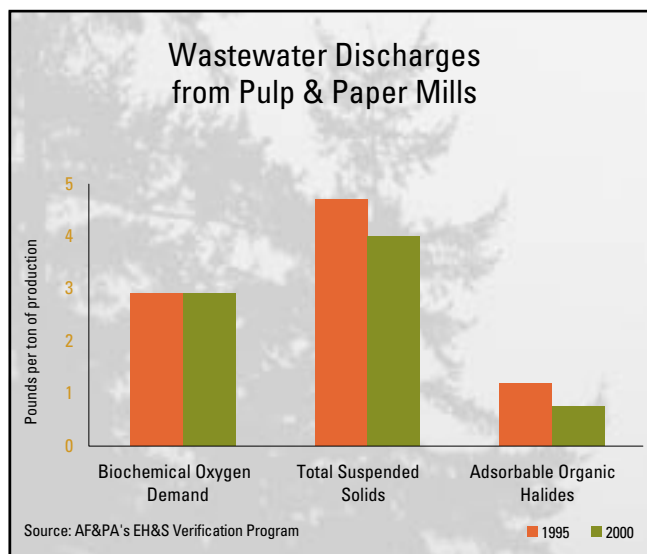
Improving Water Quality

Due to the large volumes of water used in pulp and paper processes, virtually all U.S. mills have primary and secondary wastewater treatment systems to remove various pollutants from manufacturing process wastewater. Pulp and paper mills measure the total volume of water discharged as well as the quality of the water they discharge to public wastewater treatment facilities or into receiving waters.

Key water quality indicators include:

- ■ ■ Biochemical oxygen demand (BOD);
- ■ ■ Total suspended solids (TSS); and
- ■ ■ Adsorbable organic halides (AOX).

BOD and TSS reduce the amount of oxygen available to fish and other aquatic organisms. Between 1995 and 2000, BOD discharges remained steady, and TSS discharges decreased by 15%.



In compliance with EPA's Pulp and Paper Cluster Rule, which requires the reduction of toxic pollutants released to water and air, the industry has substituted chlorine dioxide for elemental chlorine as a bleaching agent, virtually eliminating dioxin from its wastewater. This substitution has also resulted in a 37% reduction of AOX, which is an indicator of chlorinated organic substances, between 1995 and 2000.¹⁹



Encouraging Sustainable Forestry

America's forests cover 747 million acres or 33% of the country. Of this acreage, approximately 504 million acres are classified as timberland, meaning each acre of land is capable of growing 20 cubic feet of commercial wood per year. The majority of the timberland (58%) is owned by private, non-industrial owners, while 13% is owned by the forest products industry.²⁰ The remaining timberland is publicly owned. Increasingly, timberland is being managed using sustainable forestry practices.

Case Study:

Sustainable Forestry Initiative®

While there are several sustainable forestry management programs, the Sustainable Forestry Initiative® (SFI) program is the most prominent in North America. More than 90% of industrial timberland in the U.S. is enrolled in the SFI program.

The goal of the program is to promote sustainable forestry practices that will allow businesses to meet market demands while promoting the protection of wildlife, plants, soil, and air and water quality. Participants certify their land use and harvesting practices to a standard comprised of 6 sustainable forestry principles and 11 operational objectives.

Currently, of the more than 169 million acres enrolled in the SFI program in the U.S. and Canada, almost 104 million acres have been independently certified as meeting SFI program criteria by third-party auditors. In addition, participants in the SFI program have trained more than 75,000 loggers and foresters in sustainable forestry practices since 1995.²¹

Promoting Environmental Management Systems

As of October 2003, 61 forest products facilities belonging to 12 AF&PA member companies had adopted environmental management systems (EMS) certified to the ISO 14001 standard.²² Eighteen of these facilities have applied and been accepted into EPA's National Environmental Performance Track.²³



Iron & Steel

Profile

The iron and steel sector² manufactures the steel used in the production of a wide range of products, ranging from food storage containers, to defense applications, to ship hulls. In 2003, Indiana mills produced about 20% of domestic steel, with Ohio, Illinois, Michigan, and Pennsylvania leading the rest of the many other states in which steel is made.³

Advances in technology, changes in markets, and global competition have led to many changes in the iron and steel sector. More than 30 steel companies have declared bankruptcy since 1998.⁴ The sector's workforce fell from nearly 170,000 in 1997 to approximately 140,000 in 2004.⁵

PRODUCTION PROCESS To produce steel, facilities use one of two processes, which utilize different raw materials and technologies.

- "Integrated" steel mills use a blast furnace to produce iron from iron ore, coke, and fluxing agents. A basic oxygen furnace (BOF) is then used to convert the molten iron, along with up to 30% steel scrap, into refined steel.
- "Minimills" use an electric arc furnace (EAF) to melt steel scrap and limited amounts of other iron-bearing materials to produce new steel.

The scrap metal used in steel production originates from sources such as scrapped automobiles, demolished buildings, discarded home appliances, and manufacturing returns. Finishing processes, such as rolling mills, are similar at both types of mills.

PARTNERSHIPS The American Iron and Steel Institute (AISI) and the Steel Manufacturers Association (SMA) have formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the iron and steel industry. Together AISI and SMA represent the majority of U.S. steel companies.⁶

KEY ENVIRONMENTAL OPPORTUNITIES The iron and steel sector is working with EPA to improve the industry's performance by:

- ☐ Managing and minimizing waste;
- ☐ Reducing air emissions;
- ☐ Increasing energy efficiency; and
- ☐ Promoting environmental management systems.

Sector At-a-Glance

Number of Facilities:	95
Value of Shipments:	\$51 Billion
Number of Employees:	140,000

Source: American Iron & Steel Institute, 2004¹



Managing and Minimizing Waste

Two-thirds of U.S. steel is now produced from scrap, making steel America's most recycled material.⁷ In fact, all new steel contains at least 25% recycled steel.⁸ However, steelmaking still presents a variety of opportunities to remove undesirable materials from the recycling stream, increase reuse of co-products and byproducts, and reduce releases to the environment.

Automotive Scrap Metal Recycling

Obsolete automobiles are an important source of scrap metal. In 2001, the steel industry consumed the steel from 14.5 million recycled automobiles, in turn generating enough steel to produce more than 15 million new automobiles.⁹

One pressing problem in the use of scrap from automobiles is the potential presence of mercury. Automakers have used mercury in various applications, but the most prevalent use was in hood and trunk convenience light switches in domestic automobiles. Automakers phased out the use of mercury in convenience switches in 2002, but millions of older vehicles that will be recycled in the next few years contain up to a gram of mercury per car in the switches. Currently, few automotive dismantlers remove these switches before the vehicles are flattened or shredded, so the mercury is carried into the recycling stream.

EPA, steelmakers, and other stakeholders are working to limit or prevent potential emissions of mercury from convenience switches and to reduce the use of toxic materials in new products. To this end, AISI and SMA participate in a coalition with dismantlers, shredder operators, and environmental groups, known as the Partnership for Mercury Free Vehicles.¹⁰ The partnership is pursuing policy solutions, such as state legislation, to bring about the recovery of existing mercury applications and to limit future uses of mercury in vehicles. EPA is working with these and other stakeholders, including state agencies, to explore potential voluntary and regulatory solutions.

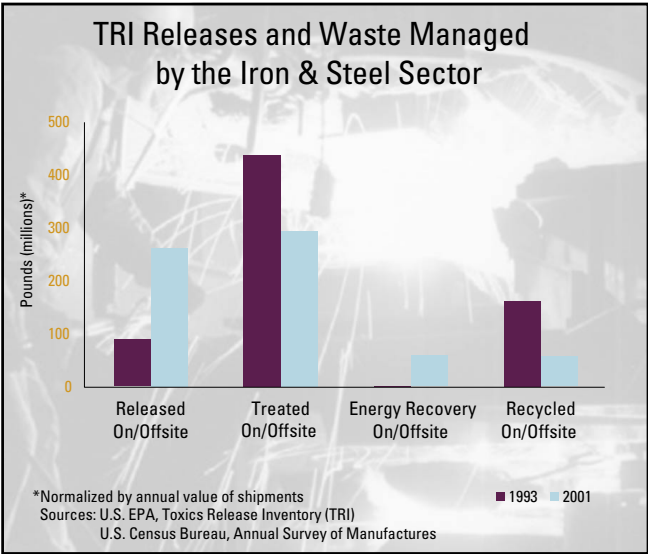
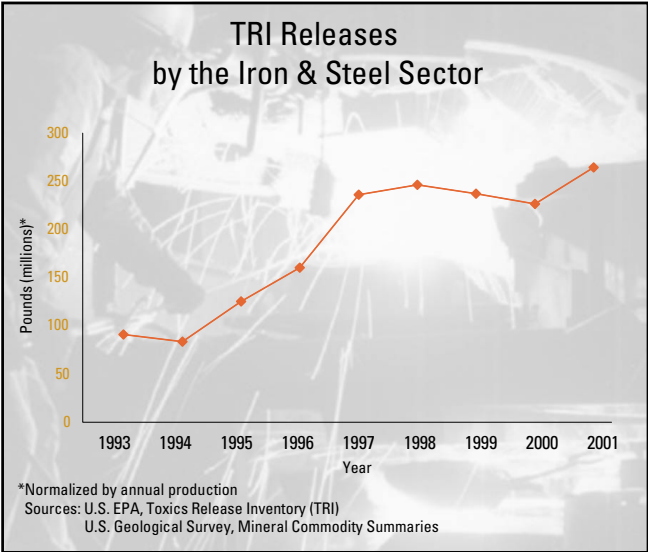
Beneficial Reuse of Slag

Through the Sector Strategies Program, steelmakers and EPA hope to increase the beneficial reuse of materials generated during steel production. For example, iron or blast furnace slag, which is formed at integrated mills when iron ore, fluxing agents, coke, and other compounds combine, can be reused for construction and agricultural applications, such as road building aggregate, cement, or soil remineralization. In 2003, approximately 19 million tons of domestic iron and steel slag, valued at approximately \$300 million, were consumed off-site.¹¹

Iron & Steel

Environmental Releases

Iron and steel facilities use a variety of chemicals and report on the release and management of many of those materials through EPA's Toxics Release Inventory (TRI). Between 1993 and 2001, normalized TRI releases by iron and steel facilities increased steadily, as new or upgraded air pollution control equipment generated additional pollution control residues for disposal. Treatment remained the predominant waste management method used in the sector, although energy recovery increased during this time period.¹²



Reducing Air Emissions

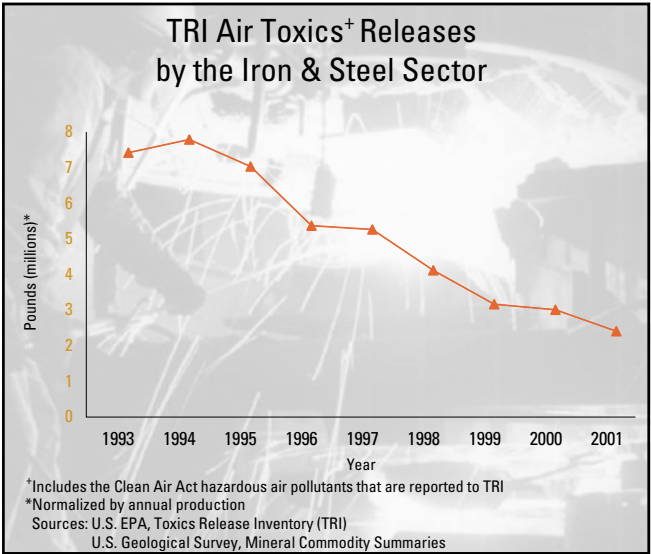
Steelmaking generates a variety of air emissions, including both hazardous air pollutant (HAP) and greenhouse gas (GHG) emissions.

Hazardous Air Pollutant Emissions

Depending upon their operations, common HAPs from iron and steel facilities include hydrochloric acid, manganese compounds, phenol, naphthalene, and benzene. Between 1993 and 2001, total normalized releases of HAPs, as reported to TRI, declined by 71% in the sector.¹³ Much of this decrease is due to the installation of pollution control equipment to meet new air requirements, such as the Clean Air Act's New Source Performance Standards.

The operation of new or upgraded air pollution control equipment at steel mills often results in the generation of additional pollution control residues, such as EAF dust and filter cakes, whose disposal must be reported to TRI as a release. Therefore, TRI releases from the iron and steel sector rose between 1993 and 2001, while TRI-reportable air emissions declined.¹⁴

Depending on economics and other factors, EAF dust can be processed to recover zinc and other materials. When zinc prices are low, however, EAF dust is more likely to be disposed and reported as a TRI release.



Greenhouse Gas Emissions

Steelmaking generates GHG emissions both directly and indirectly.

- ■ ■ ■ Integrated mills produce carbon dioxide (CO₂), a GHG, when transforming coke and iron ore into iron.
- ■ ■ ■ Both minimills and integrated mills consume significant amounts of electricity, the generation of which results in GHG emissions.

In 2003, AISI joined Climate VISION, a voluntary program administered by the U.S. Department of Energy (DOE) to reduce U.S. GHG intensity (the ratio of emissions to economic output).¹⁵ To help achieve this goal, the industry is researching alternative means of production at integrated mills that would not generate CO₂, seeking to reduce or capture GHG emissions from current production methods, and exploring ways to increase energy efficiency.¹⁶

Increasing Energy Efficiency

The iron and steel industry, which relies heavily on coal and natural gas for fuel, is one of the largest energy consumers in the manufacturing sector. In 1998, the industry used approximately 1.6 quadrillion Btus of energy, representing approximately 7% of all U.S. manufacturing use and 2% of overall domestic use.¹⁷

In a just-completed report to DOE, the industry reported achieving a 17% reduction in energy intensity per ton of steel shipped since 1990. Because of the close relationship between energy use and GHG emissions, the industry's aggregate CO₂ emissions per ton of steel shipped were reduced by a comparable amount during this same period.¹⁸

As part of their Climate VISION commitment, the industry has committed to increasing its energy efficiency by 10% by 2012 (from 2002 levels).¹⁹

Case Study: Energy Efficiency at North Star Steel

With help from DOE, North Star Steel conducted an assessment of its Wilton, LA, minimill to identify plant-level opportunities to increase energy efficiency and, in turn, reduce GHG emissions. In 2003-2004, the minimill completed two projects identified during the assessment. By installing carbon and oxygen injection in the EAF, as well as low-NO_x burners and Level 2 controls on its billet rehear furnace, the mill saved more than 58 billion Btus of electricity and natural gas, for a reduction of more than 4 million pounds of CO₂ equivalents. These and other projects will contribute to the goal of North Star's parent company, Cargill, Inc., to reduce energy use by 10% by the year 2005.²⁰

Case Study: Landfill Methane Outreach Program

Jersey Shore Steel, in Jersey Shore, PA, and the Clinton County Landfill, both members of EPA's Landfill Methane Outreach Program, developed a methane gas reclamation project to use landfill emissions for energy at the rolling mill. Jersey Shore uses gas piped from the landfill to power its rehear furnace, saving 15% in energy costs and reducing GHG emissions by 71,000 tons of CO₂ equivalents per year.²¹

Promoting Environmental Management Systems

Most of the 20 integrated mills, and more than one third of the 75 minimills that produce carbon steel, have implemented environmental management systems (EMS).²² To date, three iron and steel facilities have been accepted into EPA's National Environmental Performance Track. In addition, SMA is a Performance Track Network Partner committed to encouraging top environmental performance through EMS.²³ Through the Sector Strategies Program, EPA and its partners hope to increase the number of facilities with EMS.

Case Study: EMS at Nucor Steel

Through its EMS, Nucor Steel's Auburn, NY, minimill committed to use scrap tires as a substitute for coal in steelmaking, utilizing the tires' carbon, energy, and steel. Nucor consumed more than 600,000 tires in the first 18 months of the program, avoiding the use of 4,000 tons of coal.²⁴

Metal Casting

Profile The metal casting sector² encompasses both foundries and die casting facilities. Metal casters are primarily small businesses that produce a wide range of goods, ranging from engine blocks and cylinder heads to jewelry and plumbing fixtures.

Metal casting facilities are located across the country, but most are concentrated in the Great Lakes states, Alabama, California, and Texas.³

PRODUCTION PROCESS The metal casting process involves pouring molten metal into molds, allowing it to cool, then removing the resultant casting. Die casters and foundries utilize different casting processes.

- ■ ■ ■ Die casters produce non-ferrous (primarily aluminum) castings under high pressure in permanent metal molds.
- ■ ■ ■ Foundries cast both ferrous and non-ferrous metals, using primarily disposable molds made of sand, wax, foam, or other materials. Foundries (but not die casters) must break apart their molds in order to remove the castings.

All metal castings require some degree of finishing to remove excess metal as well as dirt, grease, oil, oxides, and rust.

PARTNERSHIPS The North American Die Casting Association (NADCA) and the American Foundry Society (AFS) have formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the metal casting industry. NADCA's membership includes corporate and individual members from more than 950 companies from the die casting industry.⁴ AFS represents nearly 10,000 members of the die casting and foundry industries.⁵

KEY ENVIRONMENTAL OPPORTUNITIES The metal casting sector is working with EPA to improve the industry's performance by:

- ☐ Increasing energy efficiency;
- ☐ Managing and minimizing waste;
- ☐ Conserving water;
- ☐ Reducing air emissions; and
- ☐ Promoting environmental management systems.

Sector At-a-Glance

Number of Facilities:	2,800
Value of Shipments:	\$28 Billion
Number of Employees:	210,000

Source: U.S. Census Bureau, 2001¹



Increasing Energy Efficiency

Given the energy-intensive nature of its manufacturing processes, reducing energy consumption is an important environmental focus for the metal casting sector. The most energy-intensive process in metal casting is the melting of metal, which accounts for approximately 55% of total energy costs.⁶ Other energy-intensive processes include core making, mold making, heat treatment, and post-casting activities. Voluntary efforts are underway in the sector to reduce the energy requirements of these key processes.

Case Study: Industries of the Future

The U.S. Department of Energy's (DOE) *Industries of the Future* (IOF) program creates government-industry partnerships to accelerate technology research, development, and deployment in nine energy-intensive industries, including metal casting.⁷

Industry participation in the program is managed by the Cast Metals Coalition (CMC), which was founded by several trade organizations, including AFS and NADCA.⁸ CMC has set measurable goals for 2020, including using 20% less energy to produce castings, compared to the sector's 1998 energy requirements of 320 trillion Btus.⁹

Some of the ways that CMC and IOF are moving toward meeting this goal include:

- *Encouraging the development of new technologies like the "lost foam" casting process, which could improve energy efficiency by as much as 27%;*
- *Increasing research on aluminum die casting alloys to reduce the weight of automotive castings, for a potential energy savings of almost 2 trillion Btus per year; and*
- *Developing software to optimize furnace controls to reduce coke/coal use by as much as 5%, for a potential energy savings of 400 million Btus per year per unit by the year 2020.¹⁰*

CMC and IOF have also set industry performance targets to develop environmental technologies to achieve 100% pre- and post-consumer recycling; 75% beneficial reuse of foundry byproducts, such as foundry sand; and the complete elimination of all waste streams.¹¹



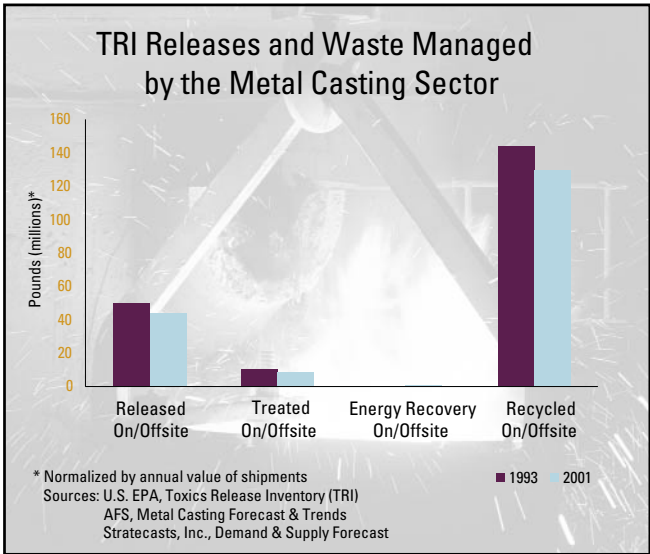
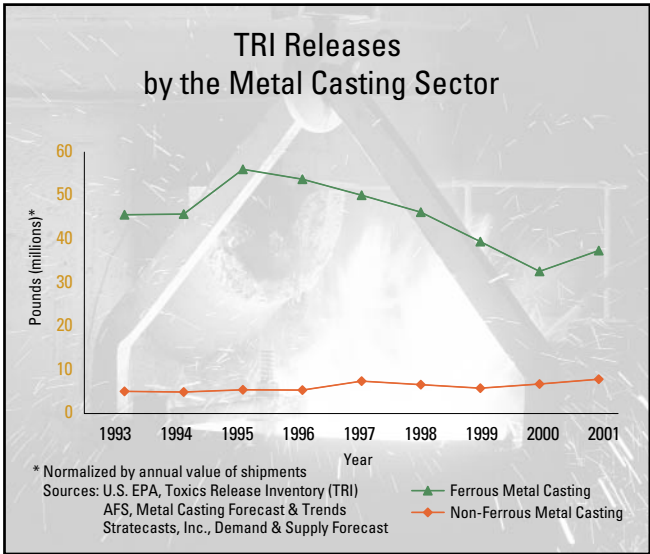
Metal Casting

Managing and Minimizing Waste

The metal casting sector is working to reduce releases to the environment and increase the reuse of industrial byproducts like foundry sand.

Reduction in Environmental Releases

Metal casters use a variety of chemicals and report on the release and management of many of those materials through EPA's Toxics Release Inventory (TRI). Over the past decade, the sector has made progress in reducing wastes. Between 1993 and 2001, normalized TRI releases by metal casting facilities decreased by 11%. These reductions can be attributed to an 18% decrease in releases from the ferrous segment of the industry, which accounts for most of the sector's releases. During this time period, most of the sector's waste was managed through recycling.¹²



Beneficial Reuse of Foundry Sand

Foundries that use sand molds utilize vibrating grids and/or conveyors to shake the mold from the casting. These foundries then reprocess the sand to remove lumps, metal, impurities, and fine particles. Although foundries can recondition and reuse sand many times, the sand eventually loses the desired physical characteristics and must be sent for reuse elsewhere or disposed of in a landfill. Markets exist for the reuse of spent foundry sand, but many states restrict its use in construction applications such as roadbeds, even when the sand is non-hazardous.

In 1998, state foundry associations, AFS, and industry suppliers formed Foundry Industry Recycling Starts Today (FIRST) to develop options for the recycling and beneficial reuse of foundry sands.¹³ One of FIRST's goals is to quantify reuse rates and set reuse goals in key states. Currently, only the state of Wisconsin requires reporting on the use and disposal of spent foundry sands. Based upon data collected from both generators and landfills, the Wisconsin Department of Natural Resources estimates that approximately 68% of the spent foundry sand generated in that state is beneficially reused.¹⁴

To encourage beneficial reuse, EPA released a review of state practices and regulations regarding foundry sand in 2002 as a resource for the industry and for states wishing to share best practices.¹⁵

Case Study: Beneficial Reuse by Resource Recovery Corporation

A Michigan cooperative, Resource Recovery Corporation (RRC), receives third-party foundry sands from many foundries, identifies beneficial reuse opportunities, and then provides a consistent supply of material to end users, such as a local asphalt company. RRC estimates that in 2002 its activities reused more than 41,000 tons of recyclable materials (including sand and metals) that would otherwise have been diverted to landfills. Since 1997, more than 210,000 tons of sand and 3,600 tons of metal have been reused through RRC.¹⁶

Conserving Water

In order to conserve water, the metal casting sector is exploring technologies for recovering and re-circulating the wastewater used to lubricate and cool dies during the die casting process.

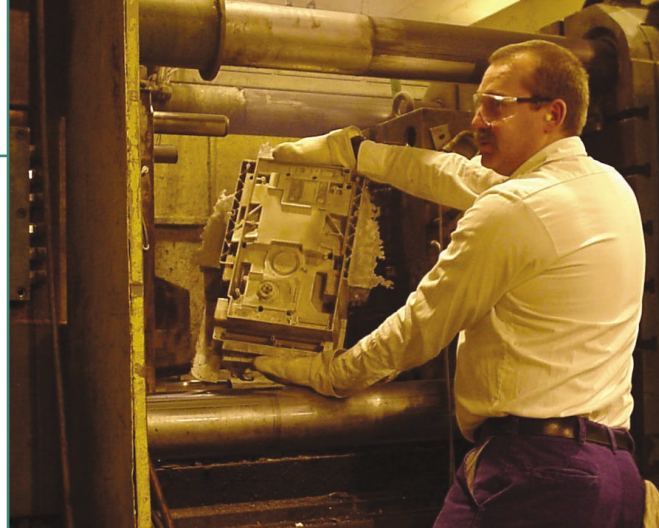
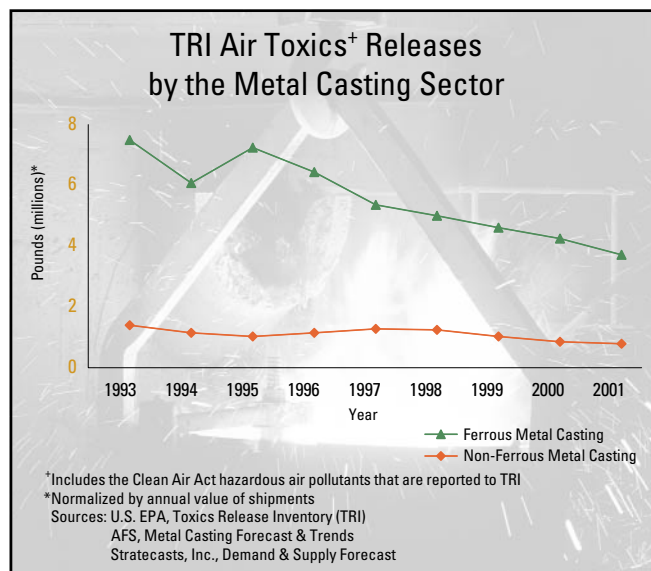
Case Study: Re-circulating Wastewater at Kennedy Die Casting, Inc.

Kennedy Die Casting in Worcester, MA, installed a wax and water-based lubrication system for its die cast machines, replacing one that was solvent-based. The new system re-circulates wastewater and reduces water discharges. Prior to the changes, Kennedy Die Casting used 7 to 8 thousand gallons of water per day. Currently Kennedy Die Casting uses 400 gallons per day.¹⁷

Reducing Air Emissions

The metal casting sector is working to reduce emissions of hazardous air pollutants (HAP), including organic air pollutants and metals. The organic air pollutants are primarily generated while making the core portions of the molds, shaking the mold away from the casting, and pouring the molten metal, while the metals are primarily generated during melting, pouring, and finishing processes.

Between 1993 and 2001, the normalized quantity of HAP releases, as reported to TRI, declined by 53% in the ferrous segment of the industry and by 60% in the non-ferrous segment.¹⁸



Promoting Environmental Management Systems

More than 50% of metal casting products are used by the automotive and transportation industries. Many automotive companies now require that their direct suppliers maintain environmental management systems (EMS) that are compliant with the ISO 14001 standard. To meet these supply chain demands, trade associations within the metal casting sector have taken an active role in encouraging the development of EMS by members.

Together with AFS, NADCA, the Indiana Cast Metals Association, and the Indiana Department of Environmental Management, the Sector Strategies Program has developed EMS tools for die casters and foundries, including customized EMS Implementation Guides and a brochure highlighting the financial benefits of EMS.¹⁹ In addition, NADCA is a Performance Track Network Partner committed to encouraging top environmental performance through EMS.²⁰

Many metal casters are finding that EMS can be an effective tool for performance improvement.

Case Study: EMS at Chicago White Metal Casting, Inc.

Chicago White Metal (CWM) in Bensenville, IL, implemented an EMS over five years ago. CWM is the first metal casting facility to be accepted into EPA's National Environmental Performance Track.²¹ Through its EMS, CWM has:

- *Recycled an additional 4,000 pounds of plastic stretch film, 5,600 wood pallets, 177,000 pounds of scrap steel, 81,000 pounds of office paper, and 148,000 pounds of corrugated material;*
- *Reduced annual solid waste disposal by 75%; and*
- *Reduced natural gas usage by at least 45%.²²*

Metal Finishing

Profile

The metal finishing sector² encompasses a variety of surface finishing and electroplating operations. Broadly speaking, metal finishing is the process of coating an object with one or more layers of metal so as to improve its wear and corrosion resistance, control friction, impart new physical properties or dimensions, and/or alter its appearance. Applications range from jewelry, to common hardware items and automotive parts, to communications equipment and aerospace technologies.

Most metal finishing shops are small, independently owned facilities that perform on a contract basis. Other metal finishing operations are a part of larger manufacturing facilities. While the industry is geographically diverse, it is concentrated in highly industrialized areas like California, Texas, and the Great Lakes states.³

Low-cost imports from overseas and other globalization trends have led to changes in this industry. Recent industry estimates indicate job losses in the range of 25-30% between 2000 and 2003, with a corresponding reduction in sales of approximately 40%.⁴

PRODUCTION PROCESS Most finished objects undergo three stages of processing:

- ■ ■ ■ Surface preparation and cleaning;
- ■ ■ ■ Surface treatment through plating, organic coating, or other chemical surface finishing; and
- ■ ■ ■ Post-treatment activities, such as rinsing and additional surface treatment.

PARTNERSHIPS Four trade associations have formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the metal finishing sector. These organizations include:

- ■ ■ ■ American Electroplaters and Surface Finishers (AESF);
- ■ ■ ■ Metal Finishing Suppliers' Association (MFSA);
- ■ ■ ■ National Association of Metal Finishers (NAMF); and
- ■ ■ ■ Surface Finishing Industry Council (SFIC).⁵

Current collaboration with the metal finishing industry builds upon the success of past partnerships, particularly the Strategic Goals Program.⁶

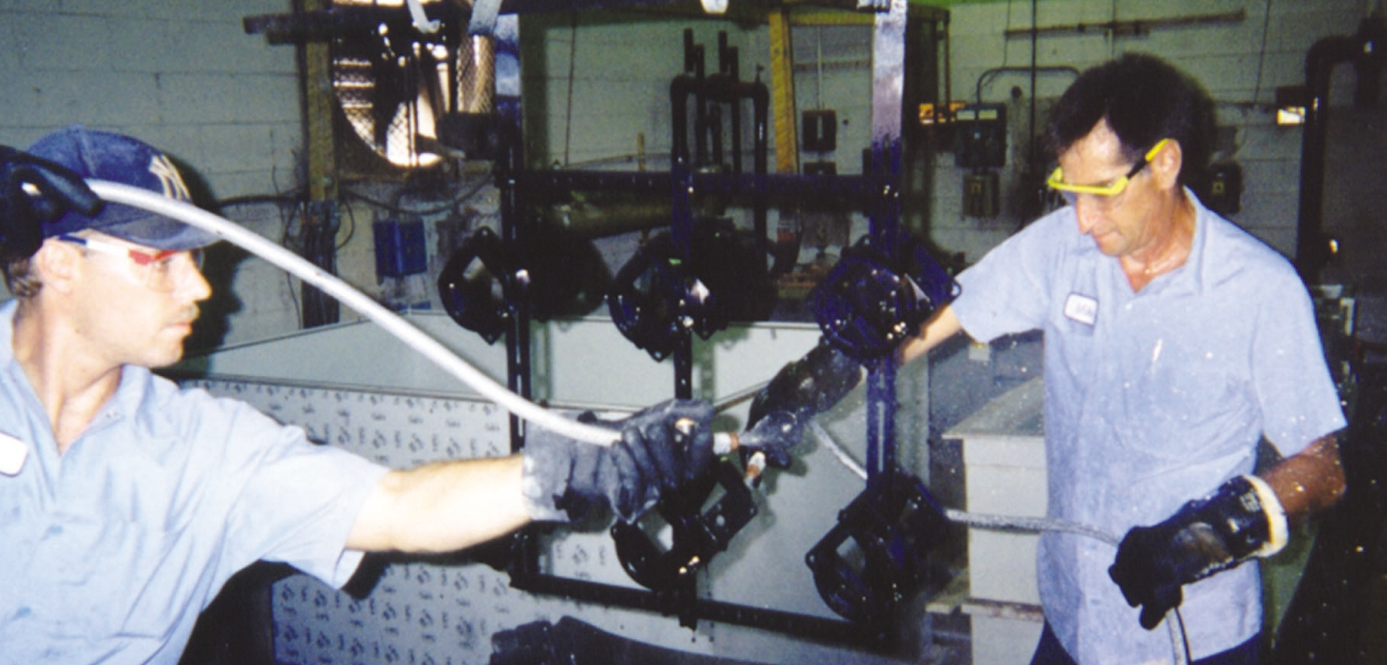
KEY ENVIRONMENTAL OPPORTUNITIES The metal finishing sector is working with EPA to improve the industry's performance by:

- Managing and minimizing waste;
- Conserving water; and
- Promoting environmental management systems.

Sector At-a-Glance

Number of Facilities:	3,200
Value of Shipments:	\$5.9 Billion
Number of Employees:	74,000

Source: U.S. Census Bureau, 2001¹



Case Study: Improving Performance through the Strategic Goals Program

Between 1998 and 2002, more than 500 metal finishers, 20 states, and 80 local regulatory agencies (primarily publicly owned treatment works) participated with EPA in the Strategic Goals Program. Participating metal finishers pursued facility-specific environmental targets for resource inputs and waste outputs, including:

- 25% reduction in energy use;
- 50% reduction in water use;
- 50% reduction in land disposal of hazardous sludge;
- 50% reduction in emissions of metals to water; and
- 90% reduction in organic chemical releases reported to EPA's Toxics Release Inventory (TRI).

Participating state and local regulatory agencies supported metal finishers in their pursuit of these goals through a strategically defined set of actions, including state recognition programs, targeted assistance, a targeted research and development agenda, and regulatory changes to reduce barriers to metals recovery and wastewater pretreatment.

An independent third-party, the National Center for Manufacturing Sciences, tracked the progress of 150 participating metal finishers that consistently reported their environmental progress. Through 2001, cumulative improvements for these facilities included:

- 7% reduction in energy use;
- 38% reduction in water use;
- 23% reduction in land disposal of hazardous sludge;
- 62% reduction in emissions of metals to water; and
- 62% reduction in organic chemical releases reported to TRI.⁷

All percentages are normalized by dollar value of sales to account for changes in production levels.

Based upon the success of the Strategic Goals Program, EPA and the trade associations are now encouraging broader use of these five indicators.



Metal Finishing

Managing and Minimizing Waste

During the metal finishing process, some portion of the materials used in production is not totally captured on the finished product and can exit the process in wastewater and waste. EPA effluent guidelines require metal finishers to treat their wastewater to remove or reduce pollutants prior to discharge to either a publicly owned treatment works or a public waterway. To comply, metal finishers add chemicals to the wastewater to remove metals and other constituents. Most metals then settle and are dewatered to form sludge. This sludge, known as F006, is regulated as a hazardous waste under the Resource Conservation and Recovery Act.

EPA's Toxics Release Inventory (TRI) does not track sludge releases, but it does track individual chemicals that may be constituents of sludge. Although less than 20% of the metal finishing sector was subject to TRI reporting requirements in 2001, it is still notable that from 1993 to 2001, the normalized amount of TRI releases from those shops decreased by 44%. In 2001, releases accounted for only 11% of the sector's waste, while 88% of metal finishing waste was treated or recycled.⁸

Improved performance was driven by the use of alternative plating chemistries, as well as by:

- ■ ■ Increased recovery of metals from the sludge; and
- ■ ■ Introduction of rinsing techniques that conserve water and reduce the volume of sludge generated.

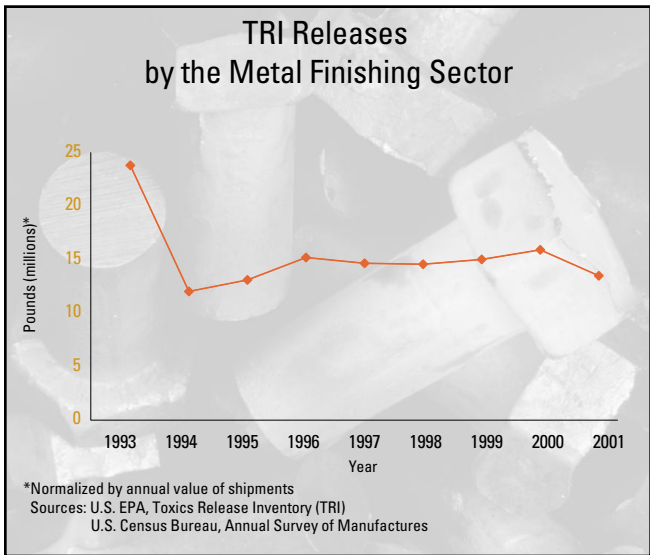
Metals Recovery through Sludge Recycling

EPA and the industry are working together to increase recovery of metals from metals-bearing sludge. EPA estimates that 10-20% of plating sludge is sent to permitted hazardous waste recycling facilities,⁹ which use techniques such as ion exchange canisters and electrowinning to recover economically valuable metals from the sludge. Metal recovery reduces land disturbance, resource depletion, energy consumption, and other environmental impacts that result from the mining and processing of virgin metal ore.

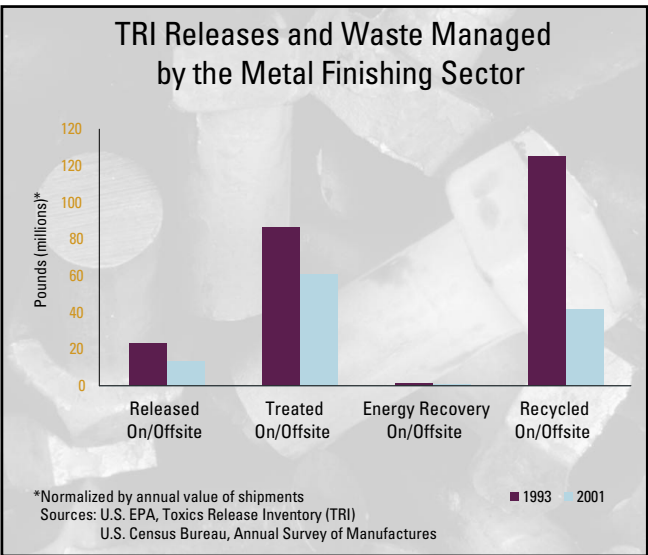
Rinsing Techniques to Reduce Sludge Generation

In many cases, metal finishers have implemented more effective and efficient rinsing techniques, such as concurrent flow rinsing, which reduce the need to treat and dispose of plating baths. These techniques result in less water use, less chemical use, and less sludge generation. For example, between 1997 and 2001, Artistic Plating Company in Anaheim, CA, reduced its sludge volume by 40% by installing flow restrictors and conductivity sensors.¹⁰

TRI Releases
by the Metal Finishing Sector



TRI Releases and Waste Managed
by the Metal Finishing Sector



Conserving Water

Water use and sludge generation go hand-in-hand for the metal finishing industry. Reducing water use at metal finishing facilities can reduce sludge generation and allow wastewater treatment systems to more successfully treat the wastewater.

Case Study: Reducing Water Use at East Side Plating

By installing two cooling towers and adding sludge dryers, East Side Plating in Portland, OR:

- *Reduced water use by 64% (between 1997 and 1999);*
- *Reduced sludge discharge by 67% (between 1997 and 1999); and*
- *Reduced permitted copper, nickel, chrome, and zinc discharges by almost 50% (between 1997 and 2002).¹¹*

Promoting Environmental Management Systems

Industry leadership has taken an active role in encouraging the development of environmental management systems (EMS) at member facilities. To help promote widespread adoption of EMS, the Sector Strategies Program partnered with the major metal finishing trade associations to create a customized EMS Implementation Guide, a brochure highlighting the financial benefits of EMS, and an EMS training program tailored to the sector.¹² Since the start of the Strategic Goals Program in 1998, over 100 metal finishing job shops, all small businesses, have completed EMS training.¹³

Many metal finishing customers, including some automobile manufacturers, are encouraging metal finishers to adopt EMS. This factor is recognized by the industry leadership and is one of the drivers behind their commitment to industry-wide EMS development. This factor also has led corporate customers to help drive EMS development by their metal finisher suppliers, and by job shops themselves to take the next step to ISO 14001 certification in order to maintain a competitive edge.



Case Study: Supply Chain Mentoring

EPA's Regional office in New England (EPA Region 1) established a novel approach to environmental stewardship through their Corporate Sponsor Program. The program encourages large equipment manufacturers to offer environmental management or environmental, health, and safety training to metal finishers and other companies within their supply chain.¹⁴

EPA's National Environmental Performance Track awarded special recognition to New Hampshire Ball Bearings, Inc., (NHBB) in Peterborough, NH, for its participation in the program. NHBB mentors suppliers and offers preferred status to suppliers with EMS.¹⁵

In addition, many metal finishers are finding that EMS can be an effective tool for performance improvement.

Case Study: EMS at SWD, Inc.

SWD, Inc., in Addison, IL, adopted an EMS in 1997 and became the first metal finisher in the U.S. to certify its EMS to the ISO 14001 standard in 1998. Through its EMS, SWD:

- *Identified the environmental impacts of molybdenum and barium as areas for improvement and took steps to eliminate both substances from all incoming raw materials;*
- *Reduced sludge by 50% between 1996 and 1998 by changing its chemical process; and*
- *Reduced water discharge by 28% between 1996 and 2000 by reusing water in non-critical rinses.¹⁶*

Case Study: EMS at Imagineering Finishing Technologies

Imagineering Finishing Technologies in South Bend, IN, implemented an EMS in 1998. Through its EMS, Imagineering identified a way to increase the recyclability of metal-bearing baths by direct discharging clean rinses (with appropriate monitoring). Between 2001 and 2003, Imagineering recycled almost 4,500 pounds of metals. Besides alleviating stress on its wastewater treatment system, this project reduced shipments of sludge to a landfill by 66% and reduced purchases of wastewater treatment chemicals by more than 9,000 pounds within one year.¹⁷